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## What is Claimed:

- 1                   1.     A method for treatment or remediation of soil or groundwater  
2     contaminated with unwanted pollutants comprising the steps of:
  - 3                   a)     preparing generally spherical zero valent iron particles having a  
4     diameter no larger than about ten millimeters and a porosity greater than 0.1; and
  - 5                   b)     placing said particles in said soil or a path of groundwater flow;  
6     whereby said particles effect reduction of said pollutants.
- 1                   2.     A method according to claim 1  
2                   including the step of introducing said zero valent iron particles into an  
3     underground aquifer via a test well positioned between a source of pollution and a well  
4     used to draw a potable water from said aquifer.
- 1                   3.     A method according to claim 1  
2                   including the step of using said zero valent iron particles to form a  
3     permeable portion of a barrier placed in an aquifer downstream of pollutant plume in  
4     said aquifer.
- 1                   4.     A method according to claim 1 including  
2                   the step of preparing said zero valent iron particles by: -
  - 3                   a)     preparing a generally spherical substrate of a material that can be  
4     converted to volatile matter or a gas at elevated temperature;
  - 5                   b)     coating said substrate with metallic iron to form a substantially  
6     continuous layer at least 0.25 nm thick;
  - 7                   c)     exposing said coated substrate to one of a chemical reagent or a  
8     temperature high enough to remove said substrate to form a hollow iron particle; and
  - 9                   d)     reducing iron oxides in said particle to metallic iron.
- 1                   5.     A method according to claim 4  
2                   including forming said zero valent iron particles with an outside diameter  
3     less than 10 nm.
- 1                   6.     A method for preparing porous iron particles having a size up to  
2     10 millimeters comprises the steps of:

3 a) preparing a generally spherical substrate of a material that can be  
4 converted to volatile matter or a gas at elevated temperature;

5 b) coating said substrate with metallic iron to form a substantially  
6 continuous layer at least 0.25 nm thick;

7 c) exposing said coated substrate to one of a chemical reagent or a  
8 temperature high enough to remove said substrate to form a hollow iron particle; and

9 d) reducing iron oxides in said particle to metallic iron.

1 7. A method according to claim 6

2 including the step of forming said substrate with a diameter no larger  
3 than about 10 millimeters.

1 8. A method according to claim 6

2 including the step of fabricating said substrate from an organic polymer  
3 selected from polymers readily fabricated into generally spherical particles less than 10  
4 millimeters in diameter that will accept deposition of an iron coating at least 0.25 nm  
5 thick and are readily removable from the iron by thermal or chemical treatment.

1 9. A method according to claim 6 including selecting a temperature  
2 for step (c) no lower than 500°C.

1 10. A method according to claim 8 including the step of selecting said  
2 organic polymer readily converted to volatile or gaseous matter at temperatures of  
3 500°C or above.

1 11. A method according to claim 6

2 including the step of charging said substrate into a solution of one of  
3 ferric or ferrous iron.

1 12. A method for treatment or remediation of groundwater  
2 contaminated with unwanted pollutants comprising the steps of:

3 a) preparing generally spherical zero valent iron particles having a  
4 diameter no larger than about ten millimeters and a porosity greater than 0.1;

5 b) charging said particles into a receptacle having an inlet and an outlet  
6 defining a pathway through said particles,

7 c) introducing said pollutant groundwater into said inlet; and

8 d) recovery cleaned water from said outlet.

1                   13.    A method according to claim 12 including the step of preparing  
2   said zero valent iron particles by:

3                   a)   preparing a generally spherical substrate of a material that can be  
4   converted to volatile matter or a gas at elevated temperature;

5                   b)   coating said substrate with metallic iron to form a substantially  
6   continuous layer at least 0.25 nm thick;

7                   c)   exposing said coated substrate to one of a chemical reagent or a  
8   temperature high enough to remove said substrate to form a hollow iron particle; and

9                   d)   reducing iron oxides in said particle to metallic iron.

1                   14.    A method according to claim 12 including forming said zero valent  
2   iron particles with an outside diameter less than 10 nm.

1                   15.    A generally spherical hollow zero valent iron particle being no  
2   larger than about ten millimeters in diameter and having a porosity greater than 0.1.

1                   16.    A zero valent iron particle according to claim 15 wherein a second  
2   metal selected from the group consisting of Pd, Pt, Ag, Co, or mixtures thereof is added  
3   to the surface of said particle in amount so that said second metal is less than about  
4   10% of the total weight of said particle.

1                   17.    A zero valent iron particle fabricated by:

2                   a)   preparing a generally spherical substrate of a material that can be  
3   converted to volatile matter or a gas at elevated temperature;

4                   b)   coating said substrate with metallic iron to form a substantially  
5   continuous layer at least 0.25 nm thick;

6                   c)   exposing said coated substrate to one of a chemical reagent or a  
7   temperature high enough to remove said substrate to form a hollow iron particle; and

8                   d)   reducing iron oxide in said particle to metallic iron.